REMARKS

The above-reference Office Action has been carefully reviewed and reconsideration thereof is respectfully requested.

Affirmation is made of the election with traverse to prosecute Claims 1-16 in this application. However, it is respectfully submitted that the requirement is improper and should be withdrawn. All claims in the application are closely related and should be examined together for reasons of efficiency and economy.

Claims 1-4, 8-10, 12, 14, and 16 have been rejected under 35 USC 103(a) as being unpatentable over Ishiyama et al. in view of Gogue and Onodera et al. Applicant respectfully traverses this ground of rejection in view of the above clarification to Claim 1.

Element (d) has been added to independent Claim 1, although the claimed structure should be evident from element (b) of that claim and any ambiguity resolved by reference to the text and the drawing figures as filed. Element (d) inserts the clarification that Applicant's shaft is formed from one homogeneous piece of material. Support for this clarification is found, for example, from inspection of Figure 1 and the text in the third paragraph of page 8 of the Specification. The shaft of Ishiyama et al. is clearly not formed from one homogeneous piece of material.

Furthermore, Applicant disagrees with the Examiner's statement that Onodera et al. teach that routine changes in a control system would have been obvious to have made the Ishiyama et al. device into a stepper motor. Onodera et al. designed three-phase stators using feedback for operation. The changes required are considerably more than routine.

With respect to Claims 8-10, 12, 14, and 16, it is noted that the device of Ishiyama et al. is a three-phase closed-loop device with a different shaft construction.

Additionally, the dependent claims either introduce limitations not shown by the reference(s) or are allowable as depending from an allowable claim.

Claim 7 has been rejected under 35 USC 103(a) as being unpatentable over Ishiyama et al. as modified by Gogue and Onodera et al. as applied to Claim 1 and further in view of Lee et al. Applicant respectfully traverses this ground of rejection and incorporates here the above remarks with respect to the first three references.

It is respectfully submitted that Lee et al. does not provide axially alternating poles on the shaft, rather the poles are axially extending. It is respectfully submitted that nothing in the references or any combination thereof teaches providing axially alternating poles after extrusion. The only disclosure of record that provides a shaft with axially alternating poles in a homogeneous piece of material is Applicant's own disclosure.

Claim 11 has been rejected under 35 USC 103(a) as being unpatentable over Ishiyama et al. as modified by Gogue and Onodera et al. as applied to Claim 1 above and further in view of Karidis et al. Applicant respectfully traverses this ground of rejection in view of the amendment to Claim 11 and incorporates here the above remarks with respect to the first three references.

Applicant's Claim 11 has been amended to insert therein the limitation that the modular stator stacks include pole pieces. Support for this amendment is found, for example, from inspection of Figure 1.

Claim 15 has been rejected under 35 USC 103(a) as being unpatentable over Ishiyama et al. as modified by Gogue and Onodera et al. as applied to Claim 1 and further in view of Enomoto et al. Applicant respectfully traverses this ground of rejection in view of the above amendment to Claim 15 and incorporates here the above remarks with respect to the first three references.

Applicant's Claim 15 now includes the limitation that the stepper motor requires no lubrication between coengaged parts thereof. Support for this amendment is found,

for example, from inspection of the text in the last paragraph on page 8 and the paragraph bridging pages 10 and 11.

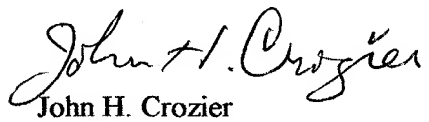
Claims 5 and 6 have been objected to as depending from a rejected base claim, but would be allowable if rewritten to include the limitations of the base claim and any intervening claims. Claim 23 is Claim 5 so rewritten and Claim 24 is Claim 6 so rewritten.

In view of the above remarks, it is respectfully submitted that the claims in the application, Claims 1-12, 14-16, 23, and 24, are allowable and early action in that regard is respectfully requested.

Should the Examiner have any questions as to the allowability of the claims or any suggestions with respect thereto, the privilege of a telephone conference with the Examiner is respectfully requested.

Date: September 5, 2002.

Respectfully submitted,



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CLEAN SET OF CLAIMS AFTER AMENDMENT

1. A linear stepper motor, comprising;

(a) an annular stator structure;

(b) an axially extending, cylindrical, permanent magnet shaft extending coaxially through said annular stator structure;

(c) said axially extending, cylindrical, permanent magnet shaft having a smooth external surface along a portion thereof with axially alternating N and S poles defined circumferentially in an outer periphery of said portion of said axially extending, cylindrical, smooth, permanent magnet shaft; and

(d) said axially extending, cylindrical, permanent magnet shaft is formed from one homogeneous piece of material.

2. A linear stepper motor, as defined in Claim 1, wherein: said portion of said axially extending, cylindrical, permanent magnet shaft is hollow.

3. A linear stepper motor, as defined in Claim 1, wherein: said portion of said axially extending, cylindrical, permanent magnet shaft has a solid core.

4. A linear stepper motor, as defined in Claim 3, wherein: said solid core is formed from a ferromagnetic material.

5. A linear stepper motor, as defined in Claim 3, wherein: said solid core is formed from a non-magnetic material.

6. A linear stepper motor, as defined in Claim 1, wherein: said stator structure includes annular disks of a high lubricity material spacing apart elements of said stator structure and serving as bearing surfaces for said axially extending shaft.

a' cont.

7. A linear stepper motor, as defined in Claim 1, wherein: at least said portion of said axially extending, cylindrical, smooth, permanent magnet shaft is constructed of a single piece of material.

8. A linear stepper motor, as defined in Claim 1, wherein: said axially extending, cylindrical, smooth, permanent magnet shaft can rotate 360° continuously or intermittently in any direction, regardless of whether or not said linear stepper motor is energized.

9. A linear stepper motor, as defined in Claim 1, wherein: said axially extending, cylindrical, smooth, permanent magnet shaft is back-driveable.

10. A linear stepper motor, as defined in Claim 1, wherein: said linear stepper motor is constructed to operate in any orientation.

11. A linear stepper motor, as defined in Claim 1, wherein: said stator structure has modular stator stacks with pole pieces to concentrate and direct magnetic flux.

12. A linear stepper motor as defined in Claim 1, wherein: said stator structure has conventionally wound coils.

14. A linear stepper motor, as defined in Claim 1, wherein: said linear stepper motor includes no lead screw and no ball screw.

15. A linear stepper motor, as defined in Claim 1, wherein: said linear stepper motor requires no lubrication of coengaged parts thereof.

A 1 cancelled.

16. A linear stepper motor, as defined in Claim 1, wherein: said linear stepper motor requires no conversion of rotary motion to linear motion.

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~~17.~~ A linear stepper motor, comprising:

(a) an annular stator structure;

(b) an axially extending, cylindrical, permanent magnet shaft extending coaxially through said annular stator structure;

(c) said axially extending, cylindrical, permanent magnet shaft having a smooth external surface along a portion thereof with axially alternating N and S poles defined circumferentially in an outer periphery of said portion of said axially extending, cylindrical, smooth, permanent magnet shaft;

(d) said portion of said axially extending, cylindrical, permanent magnet shaft has a solid core; and

(e) said solid core is formed from a non-magnetic material.

Rule 1.126

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~~18.~~ A linear stepper motor, comprising;

(a) an annular stator structure;

(b) an axially extending, cylindrical, permanent magnet shaft extending coaxially through said annular stator structure;

(c) said axially extending, cylindrical, permanent magnet shaft having a smooth external surface along a portion thereof with axially alternating N and S poles defined circumferentially in an outer periphery of said portion of said axially extending, cylindrical, smooth, permanent magnet shaft; and

(d) said stator structure includes annular disks of a high lubricity material spacing apart elements of said stator structure and serving as bearing surfaces for said axially extending shaft.